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Functional impairment among people with severe and enduring mental disorder in rural Ethiopia: A cross-sectional study

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ABSTRACT

Purpose: Evidence regarding functional impairment in people with severe mental disorders (SMD) is sparse in low and middle-income countries. The aim of this study was to identify factors associated with functional impairment in people with enduring SMD in a rural African setting.

Methods: A cross-sectional study was conducted at the baseline of a health service intervention trial. A total of 324 participants were recruited from an existing community-ascertained cohort of people with SMD (n= 218), and attendees at the Butajira General Hospital psychiatric clinic (n= 106). Inclusion criteria defined people with SMD who had ongoing need for care: those who were on psychotropic medication, currently symptomatic or had a relapse in the preceding two years. The World Health Organization Disability Assessment schedule (WHODAS-2.0) and the Butajira Functioning Scale (BFS), were used to assess functional impairment. Multivariable negative binomial regression models were fitted to investigate the association between demographic, socio-economic and clinical characteristics, and functional impairment.

Results: Increasing age, being unmarried, rural residence, poorer socio-economic status, symptom severity, continuous course of illness, medication side effects and internalized stigma were associated with functional impairment across self-reported and caregiver responses for both the WHODAS and the BFS. Diagnosis per se was not associated consistently with functional impairment.

Conclusion: To optimize functioning in people with chronic SMD in this setting, services need to target residual symptoms, poverty, medication side effects and internalized stigma. Testing the impact of community interventions to promote recovery will be useful. Advocacy for more tolerable treatment options is warranted.

Key words: Severe mental disorder, disability, low and middle income countries, schizophrenia, bipolar disorder, major depressive disorder

Background

Severe mental disorders (SMD), including schizophrenia, bipolar disorder and major depressive disorder with psychotic features, can be highly disabling illnesses [1-3]. The functional impairment seen in these conditions includes the compromised ability to work, to engage in interpersonal relationships, to care for oneself, and to participate in community activities [4]. In large, representative cohorts of people with schizophrenia in Finland [5], impairment in social functioning was present in more than 80% of participants. In a comparative study of manic or hypomanic, euthymic and depressed patients and healthy controls, 30 to 50% of people with bipolar disorder experienced significant social disability [6]. Data from the World Health Survey indicates that major depressive disorder results in the greatest disability compared with other chronic physical diseases [7].

There are very few population-based studies on the functional outcome of SMD from low- and middle-income countries (LMICs). The level of functioning of a population-based study of people with schizophrenia, bipolar disorder and severe major depressive disorder in rural Ethiopia was significantly lower than the normative value for the general population [8-10]. In studies comparing the level of functional impairment in different diagnostic categories, a mixed picture emerges, with some finding greater impairment in people with schizophrenia [11,12] and other studies showing that symptom severity was more predictive of functional impairment than clinical diagnosis [13,14].

Several studies, mostly from high income countries, identified factors that are associated with functional impairment in people with SMD: socio-demographic characteristics (male sex, older age, single or divorced marital status, urban residence, and lower socio-economic status) [15-18], illness characteristics (severity of negative and positive symptoms, long duration of untreated psychoses, co-morbid substance abuse, medication side effects, psychotic symptoms in the previous episode, low pre-morbid functioning, the number of prior episodes, prior hospital admissions, and younger age of onset) [13,15,19-23], social characteristics (lack of social support and stigma) [24,25] and cognitive impairment [4,26,27]. The association of symptom severity, medication side effects, stigma, and cognitive impairment with functional impairment is consistent across studies [17].

There is generally a lack of evidence regarding factors that are associated with functional impairment among people with SMD in LMICs. This study aimed, therefore, to elucidate the association of demographic, economic, social and clinical factors with functional impairment of people with enduring SMD in a rural African setting in order to inform service planning and development. In view of findings of previous studies and our own qualitative explorations and observations, we hypothesized that diagnostic category, severity of symptoms, medication side effects and internalized stigma would be associated with functional impairment in people with SMD.

Methods

Study design

The cross-sectional baseline data of the TaSCS (Task Sharing the Care of Severe Mental Disorders) trial [28] was used in this analysis. The aim of the TaSCS trial is to determine the effectiveness and cost-effectiveness of task-sharing mental health care for people with SMD in primary health care, compared to psychiatric nurse-led mental health care [29].

Study setting and context

The study was conducted in the town of Butajira and surrounding districts, located around 130km south of Addis Ababa, the capital city of Ethiopia. The study area is found in the Gurage and Silti Zones of the Southern Nations, Nationalities and People's Region (SNNPR) of Ethiopia. Although there are both urban and rural dwellers, the area is predominantly rural. The area has diverse climatic and topographic features. Farming is the main means of livelihood in rural areas, whereas small scale trading is common in the towns. While maize is the main subsistence grain in the lowland areas, khat and chili pepper are the main cash crops. The highlanders mainly live on "kocho" (bread made from false banana trees). The area is also diverse in terms of ethnic identity with predominance of the Gurage and Silti ethnic groups. The majority of the population is either Muslim or Orthodox Christian by religion. Mental health research has been ongoing in the Butajira area for over 15 years. It is the site for a large, population-based cohort study looking at the course and outcome of schizophrenia, bipolar disorder and major depressive disorder [30], known as the Butajira SMD study. The TaSCS trial was nested within the Butajira SMD study after the study had been running for around 12 years.

People in the Butajira area use both traditional and biomedical treatment methods for their mental health problems. At the time of this study, biomedical mental health care was limited to the out-patient psychiatric unit at Butajira General Hospital. This service was provided by two psychiatric nurses.

Participants and recruitment

The details of the characteristics of the sample and the recruitment procedure have been reported elsewhere [28]. Nevertheless, we briefly described the sample and the recruitment procedure as follows. Participants were recruited from the Butajira SMD cohort and from attendees at the Butajira General Hospital psychiatric out-patient clinic. Initially, our plan was to recruit the sample from the Butajira SMD cohort because it was community ascertained, but we did not have a big enough sample for the study. So, that is why we then decided to recruit also from the Butajira General Hospital psychiatric outpatient clinic. Inclusion criteria defined people with enduring SMD who had a need for ongoing care: those who were on psychotropic medication, currently symptomatic or had experienced relapse in the preceding two years. The sample size for the study was 324. A total of 218 participants were recruited from 507 people who were in the Butajira SMD cohort. Among those who were in the cohort, 40 refused, 32 were not contactable, 187 had no ongoing need for mental health care, 2 were restrained at home, 1 was mourning a loss, 4 had died, 2 were profoundly deaf, 1 was imprisoned, 2 had just given birth, 10 were too unwell to be transported to screening site, 7 lacked capacity to consent and actively refused and 1 caregiver was not willing to bring the patient for screening. Only three potentially eligible participants refused to participate. The remaining participants (n=106) were recruited from consecutive attendees at the psychiatric clinic at Butajira General Hospital who had been in contact with services for at least two years, were aged 25 to 65 years and who resided in the geographical catchment area of the Butajira SMD study. Twelve people who were screened and potentially eligible did not consent to participate. We considered the criteria about age and time since illness started to make the two sub-samples more similar. Also, most important is that both sub-samples were defined in relation to needing ongoing care.

For participants recruited from the Butajira SMD study, historical diagnosis of SMD at the time of recruitment for the cohort was made using Schedules for Assessment in Neuropsychiatry (SCAN) [31]. For recruits from the Butajira General Hospital psychiatric out-patient clinic, new

SCAN diagnoses were made by psychiatrists who had been trained by a psychiatrist who had training at an accredited SCAN training centre.

In addition to service users, we also included caregivers in our sample. Caregivers were defined as close family members (parents, sons/daughters, siblings or husband/wife) who were living with the person with SMD. After we finished recruiting the service users, we determined the caregiver of each service user using the above criteria.

Assessment of functional impairment

The 12 item version of the World Health Organization Disability Assessment Schedule (WHODAS-2.0) and the Butajira Functioning Scale (BFS) were used to assess functional impairment. The WHODAS is a generic, non-health condition specific, cross-cultural measure of activity limitations and social restrictions of a person in the past 30 days [32,33]. It is available in 12 and 36 item versions, can be self-administered or interviewer administered and responses can be provided by the person with the health condition, a caregiver or a clinician [34,35]. The psychometric properties of the WHODAS have been established in a number of studies [36-39]. The WHODAS has also been adapted and validated in different languages and cultures [33,35,40], including in the rural Ethiopian setting [41]. The BFS is a local functioning scale developed for people with SMD in a rural African context and piloted in the district where the current study was conducted. The BFS was developed following standard procedures, including a qualitative study [42], review of previous scales, free listing and pile sorting exercise, expert consensus, cognitive interviewing and pilot testing. The BFS has 33 shared items for men and women and 8 women-only items in three domains: self-care, work and social functioning [43]. The BFS is easy and fast to administer, with excellent internal consistency, construct and convergent validity and acceptable sensitivity to change over time. We used both the WHODAS and the BFS to assess functional impairment because we found in our previous validation studies [41,43] in that the two instruments complement with each other. Both the WHODAS and the BFS were administered to service users and caregivers.

Clinician-administered measures

The expanded version of the Brief Psychiatric Rating Scale (BPRS-E) was used to assess symptom severity. BPRS-E is a 24- item clinician administered symptom scale, which covers

four domains of symptoms of SMD (positive symptoms, negative symptoms, anxiety and depressive symptoms and manic excitement or disorganization) [44]. The BPRS-E has been used widely to detect clinical improvement in response to an intervention [45]. BPRS-E has been used previously in Ethiopia [43,46]. Psychiatric nurses who received training and ongoing supervision administered the BPRS-E. They were found to have good inter-rater reliability.

The Composite International Diagnostic Interview (CIDI) substance abuse module was used to assess khat use. The CIDI substance abuse module is a fully structured interview that ascertains the diagnosis of alcohol, tobacco and nine classes of psychoactive drugs. Excellent Kappa values for individual alcohol and drug symptoms have been reported for the CIDI substance abuse module [47]. Problematic khat use was operationalized in this study as endorsing any of the items of the CIDI relating to khat abuse or dependence. The Mini International Neuropsychiatric Interview (MINI) Suicidality Scale was used to assess self-harm and suicidal behaviors, including thought, intent and attempt. Each item is scored yes or no and weighted according to its estimated contribution to risk level. The MINI Suicidal Scale has been shown to be valid as a screen for the risk of suicidal behaviors [48]. Medication side effects were assessed using the Antipsychotic Side effects Checklist (ASC). The ASC was designed to assess a range of commonly encountered side-effects of antipsychotic medications. Clinical characteristics, including the course of psychosis and number of psychotic episodes were determined using the Life Chart Schedule (LCS) [49].

Lay-interviewer administered measures

Self-stigma was assessed using the Internalized Stigma of Mental Illness (ISMI) scale. The ISMI is a 29 item scale designed to measure the subjective experience of stigma, with five sub-scales (alienation, stereotype endorsement, perceived discrimination, social withdrawal, and stigma resistance) [50]. The ISMI has high internal consistency and test-retest reliability, and with good evidence in its convergent and construct validity [51]. The ISMI scale has been used across a wide range of languages and cultures [50]. The ISMI was used in a previous facility-based study in Ethiopia and found to have good construct validity and internal consistency [52]. An eight item, structured self-reported medication adherence measure, the Morisky Medication Adherence Scale [53], was employed to assess the extent to which patients were adherent to their respective medication. A structured self-report demographic, social and economic characteristics

questionnaire was used to collect data on sex, age, urban-rural residence, ethnic group, religion, marital status, educational status, ownership of household assets, food security and self-sufficiency and relative wealth of the participants. Experienced diploma holder data collectors were trained for two days to administer the lay-interviewer administered measures.

Data management and analysis

Data were double entered into an electronic Case Report Form using OpenClinica [54]. Data analysis took place using Stata Version 13. Frequencies and percentages were used to summarize categorical, socio-demographic and clinical characteristics, whereas mean and standard deviation were used for summarizing the continuous variables. Negative binomial regression models, for service user reported and caregiver reported scores of the WHODAS and the BFS, were fitted separately in order to see consistency of findings. Multivariable negative binomial regression models were fitted to assess the association of demographic, social, economic and clinical factors with functional impairment in people with SMD. We used negative binomial regression because WHODAS and BFS scores were not normally distributed and only non-negative integer values are possible. Crude and adjusted relative risks (RR) were used to estimate the strength of association between the independent and dependent variables. All statistical tests were set at $\alpha = 0.05$ for significance.

Ethical considerations

Ethical approval for the TaSCS trial was obtained from several international and local institutes: the Institutional Review Board of the College of Health Sciences, Addis Ababa University (Reference Number 030/12/Psy), the AHRI-ALERT Ethics Review Committee (Reference Number P037/13), the National Research Ethics Review Committee of Ethiopia (Reference Number 3.10/758/07), the Food, Medicine and Health Care Administration and Control Authority of Ethiopia (Reference Number 02/6/22/13), the University of Cape Town Human Research Ethics Committee (Reference Number 226/2011) and the United States of America's National Institute of Mental Health Data Safety and Monitoring Board (DSMB). Written informed consent was obtained from most of the participants after the nature of the study and the information sought had been fully explained. The study included a few people (n= 10) with SMD who lacked capacity to consent to participate, were not actively refusing and had a guardian to

give permission. During the study period, participants were provided with free treatment for both their mental and physical health problems.

Results

Characteristics of the participants

A total of 324 people with SMD participated in the study. Socio-demographic characteristics are presented in Table 1. Of the total sample, 47.1% (n=137) had schizophrenia, 35.5% (n= 116) had bipolar disorder and 21.9% (n=71) had major depressive disorder. Nearly half of the participants had either a continuous (27.5%) or episodic (20.1%) course for psychotic symptoms. Three quarters of participants receiving medication reported one or more medication side effects; 13.6% of the participants reported suicidal ideation in the past one month; and 6.8% reported problematic khat use. See Table 1.

Factors associated with WHODAS-2.0 scores

The mean score of the service user responses of the WHODAS was 22.3 (SD= 9.0) and of the caregiver responses was 24.7 (SD= 10.6) out of the maximum score of 60. Results from both the univariate and multivariable negative binomial regression models of the service user and caregiver reported WHODAS scores are presented in Table 2. In the multivariable model of service user reported WHODAS scores, increasing age, rural residence, being unmarried, lower perceived relative wealth, major depressive disorder, continuous course for psychosis, increasing scores of BPRS-E, increasing scores of internalized stigma and reporting two or more medication side effects were significantly associated with greater functional impairment.

In the multivariable model of caregiver reported WHODAS scores, the same factors were found to be associated with functional impairment. However, major depressive disorder, continuous course for psychosis and lower perceived relative wealth were not significantly associated. Christian religion was significantly and negatively associated with functional impairment.

Factors associated with BFS scores

The mean score of the service user responses from the BFS was 65.7 (SD= 28.5) and of the caregiver responses 76.4 (SD= 33.8) out of the maximum score of 165. Results from the univariate and multivariable negative binomial regression models of service user and caregiver reported BFS scores are presented in Table 3. As with the WHODAS, we found increasing age,

being unmarried, lower perceived relative wealth, continuous course of psychosis, increasing scores of BPRS-E, increasing scores of internalized stigma and two or more medication side effects to be associated with greater functional impairment. However, while increasing scores of MINI Suicidal Scale scores were found to be associated with greater functional impairment in addition to the above factors, rural residence and major depressive disorder were not significantly associated.

In the multivariable model of caregiver reported BFS scores, the same factors were significantly associated with functional impairment. Nevertheless, Christian religion was significantly associated with lower functional impairment and rural residence and problematic khat use were significantly associated with greater functional impairment. Continuous course of psychosis, increasing age and MINI Suicidal Scale scores were not associated with functional impairment.

Discussion

In this cross-sectional study of people with enduring SMD in a rural African setting, increasing age, being unmarried, rural residence, perceived lower relative wealth, continuous course of psychosis, higher symptom severity, internalized stigma and two or more medication side effects were consistently and significantly associated with functional impairment. Service user reported and caregiver reported scores on both the cross-cultural WHODAS and the contextually valid BFS measures gave similar patterns of associations. The study identified symptom severity, continuous course of psychosis, internalized stigma and medication side effects as important factors associated with functional impairment in people with severe and enduring SMD. The study confirmed that risk factors of functional impairment in people with SMD from high income country settings are also found to be important in LMIC settings.

A negative association was found between the diagnostic category of bipolar disorder and caregiver reported WHODAS scores and between both bipolar disorder and major depressive disorder and service user reported BFS scores, when compared to schizophrenia. In the multivariable models, however, a significant association was found only between major depressive disorder and service user reported WHODAS scores. Our sample was selected on the basis of needing ongoing mental health care, which might explain the similarity in level of functional impairment across diagnostic groups. Nonetheless, our finding is in keeping with the

evidence base [11-13,22], which indicates that the severity of symptoms, medication side effects, stigma and cognitive impairment are more important than diagnosis to predict functional impairment [17].

Among the socio-demographic factors considered in this study, increasing age and rural residence were positively associated with greater functional impairment, whereas being married was associated with lower levels of functional impairment. This is consistent with previous Ethiopian studies [8-10] and studies from elsewhere in the world [17]. Activity limitations and restrictions in participation are likely to increase with increasing age of living with severe mental illness due to deterioration of independent living skills, restricted social relationships, and comorbid medical and mental health conditions [55]. These may arise from the illness itself, medication side effects and stigma and discrimination. With regards to marital status, married people are likely to have the necessary social support to be more functional; and in addition to this there is also a likely social obligation to engage in several social activities compared to unmarried people. There is also a possibility that this association is due to reverse causality, in that better functioning people are more likely to get married and stay married. Our finding that people from rural areas are likely to have more functional impairment than urban residents is contrary to the widely held assumptions [56]. One possible explanation is that the kinds of activities rural residents are expected to perform, such as farming, are more difficult than activities of urban residents who are engaged in petty trade, office work or other small scale businesses. Therefore, rural residents are more likely to report difficulties of accomplishing those activities. An alternative explanation could be our use of culturally validated measures of functioning which are able to detect functional impairment in this rural setting. Residual confounding by socio-economic status might also contribute to the observed association.

Contrary to our expectation, economic variables, including composite scores obtained from several asset indicators as well as indicators of food security and self-sufficiency were not found to be associated with functional impairment, both in the univariate and multivariable analyses. Previous cross-sectional studies found that lower socio-economic status was associated with greater functional impairment, particularly in the interpersonal domain [57] and higher socio-economic status was associated with functional recovery [58]. Low variability in the socioeconomic status in this rural low-income setting may have contributed. Furthermore, we

only used a one-item crude indicator of food insecurity; in a neighbouring district, using a validated scale to measure food insecurity, an association between disability and food insecurity was observed in people with SMD [59]. However, the consistent association between lower perceived relative wealth and functional impairment is in keeping with our previous qualitative study [42] which suggested that the impact of SMD on functioning may be moderated by economic status.

Of the clinical characteristics considered, symptom severity and medication side effects were positively associated with functional impairment consistently in all the models estimated. There is generally a lack of evidence on the impact of medication side effects on the day to day functioning of people with SMD. Only first-generation antipsychotic medications are available in the study site, with a reportedly high burden of sedative and movement-related side effects [60]. In our previous qualitative study [42], service user and caregiver participants emphasized medication side effects as important factors for the day-to-day functioning of people with SMD. Another qualitative study in the same setting [61] found that medication side effects might contribute to non-adherence due to a desire to preserve functioning over symptom control. However, medication adherence was not found to be associated with functional impairment in our study. This may be attributed to our sample; we included stabilized people with SMD who had been in mental health care for more than 15 years. The other reason may be because Butajira SMD study participants were followed-up by project outreach workers who provided support with medication adherence. Our reliance on a self-report measure of adherence may also have under-estimated non-adherence due to social desirability bias. Although this is not consistent across measures and respondents, problematic khat use was associated with greater functional impairment. More specifically, in the univariate models, problematic khat use was associated with increasing patient-reported and caregiver-reported WHODAS scores and increasing caregiver-reported BFS scores. In the multivariable models, problematic khat use was associated only with increasing caregiver-reported BFS scores. There is lack of evidence regarding the association between khat use and functional impairment in people with SMD. A previous qualitative study in the same setting as this study found that people with SMD use khat to try to improve functioning [62]. This may be a reflection of reverse causality or perhaps khat does not actually improve functioning.

The association between clinical or illness related characteristics and functional impairment that we found in this study is consistent with the literature. A recent prospective cohort study among people with severe mental illnesses in China found a strong association between symptom severity and levels of functioning [23]. Bottlender and colleagues [13] concluded that the severity of illness symptoms and not the diagnosis of a mental disorder is the most significant factor in determining the level of functional impairment. In a ten year prospective study [19], participants with more severe psychotic symptoms demonstrated significantly more impairment in occupational functioning, irrespective of diagnosis. Hence, our findings emphasize the importance of achieving symptom remission and dealing with medication side effects as crucial aspects of the recovery process.

This study indicated that there is consistency between the responses obtained from the WHODAS and BFS measures in the kinds of factors that are found to be associated with functional impairment. Consistent association was found between symptom severity, internalized stigma, medication side effects and poverty with scores of functional impairment obtained from the WHODAS or the BFS. This is expected since our validation study of the BFS found that the two instruments have strong convergent validity [43]. Minor differences between the BFS and WHODAS relate to the association with diagnosis, MINI Suicidality scores and Khat use. The MINI Suicidality score was associated with scores on the service user reported BFS scores. Problematic Khat use was associated with the caregiver reported BFS scores. These differences indicate that the BFS, as a contextual and disease specific measure, may be more sensitive than the WHODAS.

In order to optimize the functioning of people with SMD who have ongoing need for mental health care, it may be useful to deal with the factors that are found to be consistently associated with functional impairment. For instance, community level rehabilitation services may help to improve family life and reduce stigma [63]. Mental health care services need to be expanded and give attention to controlling residual symptoms and medication side effects. Improved access to care (providing care closer to home) may affect the adequacy of symptom control [28]. There is a need for advocacy services by mental health researchers and professionals and civic organizations such as mental health service user organizations for more choice of medication and service expansion.

Strengths and limitations

Strengths of the study include use of standardized clinician evaluations for assessment of the key clinical variables, rigorous data management and use of a community-based population for our study. In addition, functional impairment was measured using two instruments: a standard, cross-cultural and locally validated instrument and a locally developed scale which was found to be contextually relevant. Responses for the outcome variable were also obtained from both service users and caregivers. Our use of two functional impairment measures and responses from service users and caregivers bring consistency to the study findings. Most of the previous studies assess functional impairment with only one instrument and obtain responses only from service users. Nevertheless, the following limitations need to be taken into account while interpreting the findings of this study. Our study is cross-sectional, and therefore the direction of association cannot be determined. We were not able to measure cognitive impairment, which is found to be consistently and strongly associated with functional impairment in several previous studies [27]. Other potential confounders, such as lifestyle factors, were not measured and adjusted in the regression models. The medication side effect scale has not been validated in the rural Ethiopian context. We used two types of sample in this study: the Butajira SMD cohort and attendees at the Butajira General Hospital psychiatric out-patient clinic. The first is a community sample while the latter is a clinical sample which may not represent the general population. Those who come to the clinic for seeking treatment may be different from those who did not and this may bring about selection bias.

Conclusions

In order to optimize functioning in people with chronic SMD in this setting, services need to target residual symptoms, poverty, medication side effects and internalized stigma. Testing the impact of adjunctive community-based interventions to promote inclusion and recovery will be useful. Advocacy for less sedating medication options is also warranted. Further research is required, in rural low income country settings, to elucidate the prospective association of socio-demographic, socio-economic and clinical characteristics with functional impairment in people with SMD.

Competing interests

The authors declare that they have no competing interests.

Availability of data and materials

The data is part of an ongoing cross-country clinical trial study, African Focus on Intervention Research for Mental Health (AFFIRM). Due to the cross-country and ongoing nature of the study, we are not able to make the data publicly available at present. However, the data set used for the current study will be made available and can be accessed from the corresponding author on reasonable request, once the study is completed within two years from now.

Authors' contributions

KH, CH, AA, GM and AF conceived and designed the study. KH trained the data collectors and CH followed up the data collection. KH did the data analysis. GM and CH supervised analysis of the data. KH wrote the first draft of the manuscript. All authors agree with the results and conclusions, contributed to the writing of the manuscript and approved the final manuscript to be submitted for possible publication

References

1. Bowie CR, Depp C, McGrath JA, Wolyniec P, Mausbach BT, Thornquist MH, Luke J, Patterson TL, Harvey PD, Pulver AE (2010) Prediction of real-world functional disability in chronic mental disorders: a comparison of schizophrenia and bipolar disorder. American Journal of Psychiatry 167:1116–1124

2. McFarlane WR, Levin B, Travis L, Lucas FL, Lynch S, Verdi M, Williams D, Adelsheim S, Calkins R, Carter CS, Cornblatt B, Taylor SF, Auther AM, McFarland B, Melton R, Migliorati M, Niendam T, Ragland JD, Sale T, Salvador M, Spring E (2015) Clinical and functional outcomes after 2 Years in the early detection and intervention for the Prevention of Psychosis Multisite Effectiveness Trial. Schizophrenia Bulletin 41 (1):30-43

3. Waghorn G, Chant D, Jaeger J (2007) Employment functioning and disability among community residents with bipolar affective disorder: results from an Australian community survey. Bipolar Disorders 9:166-182

4. Dickerson F, Boronow JJ, Ringel N, Parente F (1999) Social functioning and neurocognitive deficits in outpatients with schizophrenia: a 2-year follow-up1. Schizophrenia Research 37:13-20

5. Honkonen T, Saatinen S, Salokangas RKR (1999) Deinstitutionalization and Schizophrenia in Finland II: Discharged Patients and Their Psychosocial Functioning. Schizophrenia Bulletin 25 (3):543-551

6. Martínez-Arán A, Vieta E, Reinares M, Colom F, Torrent C, Sánchez-Moreno J, Benabarre A, Goikolea JM, Comes M, Salamero M (2004) Cognitive Function Across Manic or Hypomanic, Depressed, and Euthymic States in Bipolar Disorder. American Journal of Psychiatry 161 (2):262-270

7. Moussavi S, Chatterji S, Verdes E, Tandon A, Patel V, Ustun B (2007) Depression, chronic diseases, and decrements in health: results from the World Health Surveys. Lancet (London, England) 370:851–858. doi:doi:10.1016/S0140-6736(07)61415-9

8. Kebede D, Alem A, Shibre T, Negash A, Deyassa N, Beyero T, Medhin G (2005) Short-term symptomatic and functional outcomes of schizophrenia in Butajira, Ethiopia. Schizophrenia Research 78:171– 185. doi:doi:10.1016/j.schres.2005.05.028

9. Kebede D, Alem A, Shibire T, Deyassa N, Negash A, Beyero T, Medhin G, Fekadu A (2006) Symptomatic and functional outcome of bipolar disorder in Butajira, Ethiopia. Journal of Affective Disoders 90:239–249. doi:doi:10.1016/j.jad.2005.11.009

10. Mogga S, Prince M, Alem A, Kebede D, Stewart R, Glozier N, Hotopf M (2006) Outcome ofmajor depression in Ethiopia: Population-based study. British Journal of Psychiatry 189:241- 246. doi:doi : 1 0 .11 9 2 / bjp . bp .1 0 5 . 0 13 4 17

11. Mausbach BT, Harvey PD, Pulver AE, Depp CA, Wolyniec PS, Thornquist MH, Luke JR, McGrath JA, Bowie CR, Patterson TL (2010) Relationship of the Brief UCSD Performance-based Skills Assessment (UPSA-B) to multiple indicators of functioning in people with schizophrenia and bipolar disorder. Bipolar Disorders 12:45-55

12. Judd LL, Schettler PJ, Solomon DA, Maser JD, Coryell W, Endicott J, Akiskal HS (2008) Psychosocial disability and work role function compared across the long-term course of bipolar I, bipolar II and unipolar major depressive disorders. Journal of Affective Disorders 108:49-58

13. Bottlender R, Strauß A, Möller H-J (2010) Social disability in schizophrenic, schizoaffective and affective disorders 15 years after first admission. Schizophrenia Research 116:9-15

14. Brissos S, Dias VV, Carita AI, Martinez-Arán A (2008) Quality of life in bipolar type I disorder and schizophrenia in remission: Clinical and neurocognitive correlates. Psychiatry Research 160 55-62

15. Martinez-Aran A, Vieta E, Torrent C, Sanchez-Moreno J, Goikolea JM, Salamero M, Malhi GS, Gonzalez-Pinto A, Daban C, Alvarez-Grandi S, Fountoulakis K, Kaprinis G, Tabares-Seisdedos R, Ayuso-Mateos JL (2007) Functional outcome in bipolar disorder: the role of clinical and cognitive factors. Bipolar Disorders 9:103-113

16. MacQueen GM, Young LT, Joffe RT (2001) A review of psychosocial outcome in patients with bipolar disorder. ACTA PSYCHIATRICA SCANDINAVICA 103:163-170

17. Harvey PD, Strassnig M (2012) Predicting the severity of everyday functional disability in people with schizophrenia: cognitive deficits, functional capacity, symptoms, and health status. World Psychiatry 11:73-79

18. Swartz MS, Miller DD, Wagner HR, Reimherr F, Swanson JW, Khan A, Stroup TS, Cañive JM, McEvoy JP, Lieberman JA, McGee M (2006) Substance use and psychosocial functioning in schizophrenia among new enrollees in the NIMH CATIE Study. Psychiatric Services 57 (8):1110-1116

19. Racenstein JM, Harrow M, Reed R, Martin E, Herbener E, Penn DL (2002) The relationship between positive symptoms and instrumental work functioning in schizophrenia: a 10 year follow-up study. Schizophrenia Research 56 (1):95-103

20. Marchesi C, Affaticati A, Monici A, De Panfilis C, Ossola P, Ottoni R, Tonna M (2015) Decrease of Functioning in Remitted and Non-Remitted Patients 16 Years After a First-Episode Schizophrenia. The Journal of nervous and mental disease 203 (6):406-411

21. Kovasznay B, Fleischer J, Tanenberg-Karant M, Jandorf U, Miller AD, Bromet E (1997) Substance use disorder and the early course of illness in schizophrenia and affective psychosis. Schizophrenia Bulletin, Vol 23, No 2, 23 (2):195-201

22. Cannon M, Jones P, Gilvarry C, Rifkin L, McKenzie K, Foerster A, Murray RM (1997) Premorbid social functioning in schizophrenia and bipolar disorder: Similarities and differences. American Journal of Psychiatry 154:1544-1550

23. Chien W-T, Lam CK, Ng BF (2015) Predictors of levels of functioning among Chinese people with severe mental illness: a 12-month prospective cohort study. Journal of Clinical Nursing 24:1860-1873. doi:doi: 10.1111/jocn.12843

24. Perlick DA, Rosenheck RA, Clarkin JF, Sirey JA, Salahi J, Struening EL, Link BG (2001) Stigma as a barrier to recovery: Adverse effects of perceived stigma on social adaptation of persons diagnosed with bipolar affective disorder. Psychiatric Services 52 (12):1627-1632

25. Rüesch P, Graf J, Meyer PC, Rössler W, Hell D (2004) Occupation, social support and quality of life in persons with schizophrenic or affective disorders. Social Psychiatry and Psychiatric Epidemiology 39:686-694. doi:DOI 10.1007/s00127-004-0812-y

26. Addington J, Addington D (2000) Neurocognitive and social functioning in schizophrenia: a 2.5 year follow-up study. Schizophrenia Research 44:47-56

27. Addington J, Addington D (2008) Social and cognitive functioning in psychosis Schizophrenia Research 99:176-181

28. Hanlon C, Alem A, Medhin G, Shibre T, Ejigu DA, Negussie H, Dewey M, Wissow L, Prince M, Susser E, Lund C, Fekadu A (2016) Task sharing for the care of severe mental disorders in a low-income country (TaSCS): study protocol for a randomised, controlled, non-inferiority trial. Trials 17 (76). doi:DOI 10.1186/s13063-016-1191-x

29. Lund C, Alem A, Schneider M, Hanlon C, Ahrens J, Bandawe C, Bass J, Bhana A, Burns J, Chibanda D, Cowan F, Davies T, Dewey M, Fekadu A, Freeman M, Honikman S, Joska J, Kagee A, Mayston R, Medhin G, Musisi S, Myer L, Ntulo T, Nyatsanza M, Ofori-Atta A, Petersen I, Phakathi S, Prince M, Shibre T, Stein DJ, Swartz L, Thornicroft G, Tomlinson M, Wissow L, Susser E (2015) Generating evidence to narrow the treatment gap for mental disorders in sub-Saharan Africa: rationale, overview and methods of AFFIRM. Epidemiology and psychiatric sciences. doi:DOI: 10.1017/S2045796015000281

30. Kebede D, Alem A, Shibre T, Fekadu A, Fekadu D, Kullgren G, al e (2000) The Butajira-Ethiopia study on the incidence, course and outcome of schizophrenia and bipolar disorders. I. Descriptions of study settings, methods and preliminary results. Schizophrenia Research 41:78

31. World Health Organization (1997) Schedules for Clinical Assessment in Neuropsychiatry, version 2.1. Geneva

32. Chang K-H, Lin Y-N, Liao H-F, Yen C-F, Escorpizo R, Yen T-H, Liou T-H (2014) Environmental effects on WHODAS 2.0 among patients with stroke with a focus on ICF category e120. Quality of Life Research 23:1823–1831. doi:DOI 10.1007/s11136-014-0624-9

33. Silva C, Coleta I, Silva AG, Amaro A, Alvarelhão J, Queirós A, Rocha N (2013) Adaptation and validation of WHODAS 2.0 in patients with musculoskeletal pain. Rev Saúde Pública 47 (4):1-6. doi:DOI: 10.1590/S0034-8910.2013047004374

34. Üstün TB, Chatterji S, Kostanjsek N, Rehm J, Kennedy C, Epping-Jordan J, Saxena S, Korffe MV, Pullf C (2010) Developing the World Health Organization Disability Assessment Schedule 2.0. Bulletin of the World Health Organization 88:815–823. doi:doi:10.2471/BLT.09.067231

35. Kirchberger I, Braitmayer K, Coenen M, Oberhauser C, Meisinger C (2014) Feasibility and psychometric properties of the German 12-item WHO Disability Assessment Schedule (WHODAS 2.0) in a population-based sample of patients with myocardial infarction from the MONICA/KORA myocardial infarction registry. Population Health Metrics 12 (27). doi:doi:10.1186/s12963-014-0027-8

36. Gold LH (2014) DSM-5 and the Assessment of Functioning: The World Health Organization Disability Assessment Schedule 2.0 (WHODAS 2.0). The Journal of the American Academy of Psychiatry and the Law 42 (2):173–181

37. Garin O, Ayuso-Mateos JL, Almansa J, Nieto M, Chatterji S, Vilagut G, Alonso J, Cieza A, Svetskova O, Burger H, Racca V, Francescutti C, Vieta E, Kostanjsek N, Raggi A, Leonardi M, Ferrer M (210) Validation of the "World Health Organization Disability Assessment Schedule, WHODAS-2" in patients with chronic diseases. Health and Quality of Life Outcomes 8 (51). doi:doi: 10.1186/1477-7525-8-51

38. Downing NR, Kim J-I, Williams JK, Long JD, Mills JA, Paulsen JS (2014) WHODAS 2.0 in prodromal Huntington disease: measures of functioning in neuropsychiatric disease. European Journal of Human Genetics 22:958–963. doi:doi:10.1038/ejhg.2013.275

39. Thomas C, Narahari SR, Bose KS, Vivekananda KN, Steven, West DP, Kwasny M, Kundu RV (2014) Comparison of Three Quality of Life Instruments in Lymphatic Filariasis: DLQI, WHODAS 2.0, and LFSQQ. PLoS Neglected Tropical Diseases 8 (2):e2716. doi:doi:10.1371/journal.pntd.0002716

40. Hu L, Zang Y-L, Li N (2012) The applicability of WHODAS 2.0 in adolescents in China. Journal of Clinical Nursing 21:2438–2451. doi:doi: 10.1111/j.1365-2702.2012.04126.x

41. Habtamu K, Alem A, Medhin G, Fekadu A, Dewey M, Prince M, Hanlon C (2017) Validation of the World Health Organization Disability Assessment Schedule in people with severe mental disorders in rural Ethiopia. Health and Quality of Life Outcomes 15:64

42. Habtamu K, Alem A, Hanlon C (2015) Conceptualizing and contextualizing functioning in people with severe mental disorders in rural Ethiopia: a qualitative study. BMC Psychiatry 15 (34). doi:DOI 10.1186/s12888-015-0418-9

43. Habtamu K, Alem A, Medhin G, Fekadu A, Prince M, Hanlon C (2016) Development and validation of a contextual measure of functioning for people living with severe mental disorders in rural Africa. BMC Psychiatry 16 (311)

44. Overall J, Gorham D (1962) The Brief Psychiatric Rating Scale. Psychological Reports 10:799-812

45. Gray R, Leese M, Bindman J, Becker T, Burti L, David A, Gournay K, Kikkert M, Koeter M, Puschner B, Schene A, Thornicroft G, Tansella M (2006) Adherence therapy for people with schizophrenia: European multicentre randomised controlled trial. British Journal of Psychiatry 189 (6):508-514. doi:DOI: 10.1192/bjp.bp.105.019489

46. Youngmann R, Zilber N, Workneh F, Giel R (2008) Adapting the SRQ for Ethiopian Populations: A Culturally-Sensitive Psychiatric Screening Instrument. Transcultural Psychiatry 45 (4):566–589. doi:DOI: 10.1177/1363461508100783

47. Cottler LB, Robins LN, Helzer JE (1989) The reliability of the CIDI-SAM: a comprehensive substance abuse interview. British Journal of Addiction 84 (7):801-814

48. Roaldset JO, Linaker OM, Bjørkly S (2012) Predictive Validity of the MINI Suicidal Scale for Self-Harm in Acute Psychiatry: A Prospective Study of the First Year after Discharge. Archives of Suicide Research 16 (4):287-302

49. Susser E, Finnerty M, Mojtabai R, Yale S, Conover S, Goetz R, Amador X (2000) Reliability of the Life Chart Schedule for assessment of the long-term course of schizophrenia. Schizophrenia Research 42 (1):67-77

50. Boyda JE, Adler EP, Otilingama PG, Peters T (2014) Internalized Stigma of Mental Illness (ISMI) Scale: A multinational review. Comprehensive Psychiatry 55 (1):221-231

51. Ritshera JB, Otilingama PG, Grajalesa M (2003) Internalized stigma of mental illness: psychometric properties of a new measure. Psychiatry Research 121 (1):31-49

52. Assefa D, Shibre T, Asher L, Fekadu A (2012) Internalized stigma among patients with schizophrenia in Ethiopia: a cross-sectional facility-based study. BMC Psychiatry 12:239

53. Morisky DE, Ang A, Krousel-Wood M, Ward HJ (2008) Predictive Validity of A Medication Adherence Measure in an Outpatient Setting. J Clin Hypertens (Greenwich) 10 (5):348–354

54. Cavelaars M, Rousseau J, Parlayan C, de Ridder S, Verburg A, Ross R, Visser GR, Rotte A, Azevedo R, Boiten J-W, Meijer GA, Belien JA, Verheul H (2015) OpenClinica. Journal of Clinical Bioinformatics 5(Suppl 1):S2

55. Mueser KT, Pratt SI, Bartels SJ, Swain K, Forester B, Cather C, Feldman J (2010) Randomized Trial of Social Rehabilitation and Integrated Health Care for Older People with Severe Mental Illness. J Consult Clin Psychol 78 (4):561–573. doi:doi:10.1037/a0019629

56. Cohen A, Patel V, Thara R, Gureje O (2008) Questioning an Axiom: Better Prognosis for Schizophrenia in the Developing World? Schizophrenia Bulletin 34:229-244. doi:doi:10.1093/schbul/sbm105

57. Goldstein TR, Birmaher B, Axelson D, Goldstein BI, Gill MK, Esposito-Smythers C, Ryan ND, Strober MA, Hunt J, Keller M (2009) Psychosocial functioning among bipolar youth. Journal of Affective Disoders 114:174–183. doi:doi:10.1016/j.jad.2008.07.001

58. Harrow M, Jobe TH (2007) Factors Involved in Outcome and Recovery in Schizophrenia Patients Not on Antipsychotic Medications: A 15-Year Multifollow-Up Study. The Journal of nervous and mental disease 195 (5):406–414. doi:DOI: 10.1097/01.nmd.0000253783.32338.6e

59. Tirfessa K, Lund C, Medhin G, Hailemichael Y, Fekadu A, Hanlon C (2017) Food insecurity among people with severe mental disorder in a rural Ethiopian setting: a comparative, population-based study. Epidemiology and psychiatric sciences:1-11. doi:10.1017/s2045796017000701

60. Leucht S, Corves C, Arbter D, Engel RR, Li C, Davis JM (2009) Second-generation versus first-generation antipsychotic drugs for schizophrenia: a meta-analysis. Lancet (London, England) 373 (9657):31-41. doi:10.1016/s0140-6736(08)61764-x

61. Teferra S, Hanlon C, Beyero T, Jacobsson L, Shibre T (2013) Perspectives on reasons for non-adherence to medication in persons with schizophrenia in Ethiopia: a qualitative study of patients, caregivers and health workers. BMC Psychiatry 13:168

62. Teferra S, Hanlon C, Alem A, Jacobsson L, Shibre T (2011) Khat chewing in persons with severe mental illness in Ethiopia: A qualitative study exploring perspectives of patients and caregivers. Transcultural Psychiatry 48 (4):455–472. doi:DOI: 10.1177/1363461511408494

63. Asher L, De Silva M, Hanlon C, Weiss HA, Birhane R, Ejigu DA, Medhin G, Patel V, Fekadu A (2016) Community-based Rehabilitation Intervention for people with Schizophrenia in Ethiopia (RISE): study protocol for a cluster randomised controlled trial. Trials 17:299

1 **Table 1: Socio-demographic and clinical characteristics of participants (n=324)**

Characteristics		N	%
Socio-demographic characteristics			
Sex	Female	109	33.6
	Male	215	66.4
Age (years)		Mean 40.5	[a]SD 10.96
Marital status	Single	86	26.5
	Married	207	63.9
	Divorced	19	5.9
	Widowed	12	3.7
Residence	Urban	45	13.9
	Rural	279	86.1
Unable to read and write	Yes	170	52.6
Number of years of education completed		Mean 2.5	SD 3.5
Ethnicity	Gurage	256	79.0
	Silti	60	18.5
	Other	8	2.5
Religion	Muslim	247	76.2
	Orthodox Christian	43	13.3
	Protestant	31	9.6
	Catholic	3	0.9
Occupation	Employed/self-employed	32	9.9
	Farmer	170	52.5
	Housewife	68	21.0
	Student	3	0.9
	Unemployed	51	15.7
[g]Relative wealth	Less	165	51.0
	Same or more	158	49.0
Clinical characteristics			
Diagnosis	Schizophrenia	137	42.3
	Bipolar disorder	116	35.8
	Major depressive disorder	71	21.9
Course type for psychosis	Episodic	65	20.1
	Continuous	89	27.5
	Neither episodic nor continuous	17	5.3
	Never psychotic for six months	153	47.2
Suicide attempts in the last one year	Yes	5	1.5
Suicidal ideation in the past one month	Yes	44	13.6
Total [b]MINI Suicidal Scale score		Mean 1.1	SD 2.3
[c]BPRS-E total score		Mean 29.6	SD 7.3
Total ISMI score[d]		Mean 54.3	SD 15.8
[e]WHODAS total score (service user version)		Mean 22.3	SD 9.0
WHODAS total score (caregiver version)		Mean 24.7	SD 10.6
[f]BFS total score (service user version)		Mean 65.7	SD 28.5
BFS total score (caregiver version)		Mena 76.4	SD 33.8
Medication adherence		Mean 5.9	SD 1.4
Restrained in the past one month	Yes	5	1.5
Problematic Khat use	Yes	22	6.8
Medication side effect	None	82	25.5
	One	16	5.0
	Two or more	223	69.5

2 [a]SD: Standard deviation

[b]MINI: Mini International Neuropsychiatric Interview
[c]BPRS-E: expanded version of the Brief Psychiatric Rating Scale
[d]ISMI: Internalized stigma of mental illness
[e]WHODAS: World Health Organization Disability Assessment Schedule
[f]BFS: Butajira Functioning Scale
[g]Relative wealth refers to an individual's perception about his/her wealth relative to other people in the neighborhood

Table 2: Univariate and multivariable association of demographic, economic, social and clinical factors with WHODAS-2.0 scores

Variables		[a]CRR (95% CI)		[b]ARR (95% CI)	
		Patient-reported	**Caregiver-reported**	**Patient-reported**	**Caregiver-reported**
Sex	Female	1.0	1.0	1.0	1.0
	Male	1.02 [0.93, 1.12]	**1.15 [1.04, 1.26]**	0.92 [0.84, 1.01]	0.98 [0.88, 1.10]
Age		**1.00 (1.00, 1.01]**	1.00 [0.997, 1.004]	**1.01 [1.002, 1.01]**	**1.004 [1.00, 1.01]**
Marital status	Single	1.0	1.0	1.0	1.0
	Married	0.96 [0.87, 1.06]	**0.87 [0.78, 0.96]**	**0.85 [0.78, 0.92]**	**0.81 [0.73, 0.90]**
	Never married	1.14 [0.97, 1.33]	1.01 [0.85, 1.19]	0.92 [0.81, 1.05]	0.89 [0.75, 1.05]
Number of years of education completed		0.98 [0.97, 0.997]	0.99 [0.97, 1.00]	0.999 [0.988, 1.01]	0.99 [0.98, 1.01]
Religion	Muslim	1.0	1.0	1.0	1.0
	Christian	**0.90 [0.81, 0.99]**	**0.82 [0.74, 0.92]**	0.97 [0.89, 1.05]	**0.89 [0.81, 0.98]**
Residence	Urban	1.0	1.0	1.0	1.0
	Rural	1.12 [0.99, 1.27]	**1.18 [1.03, 1.35]**	**1.13 [1.02, 1.26]**	**1.19 [1.05, 1.34]**
Asset		0.98 [0.95, 1.006]	0.99 [0.95, 1.02]	0.999 [0.97, 1.03]	1.01 [0.98, 1.04]
Food security/self-sufficiency		**0.94 [0.91, 0.97]**	0.97 [0.93, 1.00]	1.01 [0.98, 1.04]	1.01 [0.97, 1.04]
Relative wealth	Less	1.0	1.0	1.0	1.0
	Same or more	**0.79 [0.72, 0.85]**	**0.91 [0.83, 0.99]**	**0.83 [0.77, 0.89]**	0.92 [0.84, 1.01]
Diagnosis	Schizophrenia	1.0	1.0	1.0	1.0
	Bipolar disorder	0.96 [0.87, 1.06]	**0.84 [0.76, 0.94]**	1.08 [0.999, 1.16]	0.99 [0.90, 1.08]
	Major depressive disorder	1.10 [0.98, 1.22]	0.91 [0.81, 1.03]	**1.16 [1.06, 1.28]**	1.05 [0.94, 1.18]
Course type for psychosis	Episodic	1.0	1.0	1.0	1.0
	Continuous	**1.30 [1.16, 1.46]**	**1.36 [1.20, 1.54]**	**1.15 [1.04, 1.28]**	1.08 [0.95, 1.22]
	Neither	1.16 [0.96, 1.40]	1.17 [0.95, 1.45]	1.09 [0.94, 1.27]	1.03 [0.85, 1.23]
	Never psychotic	0.91 [0.82, 1.02]	0.94 [0.84, 1.06]	0.91 [0.84, 0.99]	0.94 [0.85, 1.04]
BPRS-E[c]		**1.02 [1.01, 1.03]**	**1.02 [1.018, 1.03]**	**1.01 [1.001, 1.01]**	**1.02 [1.01, 1.02]**
Total MINI score[d]		**1.03 [1.01, 1.05]**	1.01 [0.99, 1.03]	1.01 [0.99, 1.03]	0.997 [0.98, 1.02]
Total ISMI score[e]		**1.01 [1.01, 1.02]**	**1.01 [1.007, 1.013]**	**1.01 [1.007, 1.01]**	**1.01 [1.004, 1.01]**
Problematic khat use	No	1.0	1.0	1.0	1.0
	Yes	**1.25 [1.06, 1.48]**	**1.41 [1.18, 1.69]**	1.08 [0.94, 1.23]	1.14 [0.97, 1.34]
Medication side effect	None	1.0	1.0	1.0	1.0
	One	1.15 [0.94, 1.42]	1.15 [0.88, 1.38]	0.99 [0.84, 1.15]	0.95 [0.78, 1.15]
	Two or more	**1.19 [1.08, 1.31]**	**1.23 [1.11, 1.37]**	**1.17 [1.07, 1.27]**	**1.17 [1.06, 1.30]**
Medication adherence		1.00 [0.97, 1.03]	1.00 [0.97, 1.03]	0.99 [0.98, 1.02]	1.01 [0.98, 1.04]
				N[f]= 312 Pseudo R^2= 0.07	N[f]= 312 Pseudo R^2= 0.10

[a]CRR: Crude Relative Risk
[b]ARR: Adjusted Relative Risk
[c]BPRS-E: expanded version of the Brief Psychiatric Rating Scale
[d]MINI: Mini International Neuropsychiatric Interview
[e]ISMI: Internalized stigma of mental illness
[f]N: Number of observations

Table 3: Univariate and multivariable association of demographic, economic, social and clinical factors with BFS scores

Variables		[a]CRR (95% CI)		[b]ARR (95% CI)	
		Patient-reported	**Caregiver- reported**	**Patient-reported**	**Caregiver-reported**
Sex	Female	1.0	1.0	1.0	1.0
	Male	1.05 [0.95, 1.1.5]	**1.16 [1.04, 1.28]**	0.93 [0.84, 1.03]	0.96 [0.85, 1.07]
Age		1.00 [0.99, 1.004]	0.999 [0.99, 1.00]	**1.004 [1.00, 1.01]**	1.003 [0.99, 1.01]
Marital status	Single	1.0	1.0	1.0	1.0
	Married	**0.77 [0.69, 0.85]**	**0.76 [0.68, 0.85]**	**0.69 [0.63, 0.77]**	**0.72 [0.65, 0.80]**
	Never married	0.98 [0.83, 1.15]	0.93 [0.78, 1.11]	**0.83 [0.71, 0.97]**	**0.83 [0.70, 0.99]**
Number of years of education completed		0.99 [0.98, 1.004]	0.99 [0.98, 1.01]	1.00 [0.99, 1.01]	0.99 [0.98, 1.01]
Religion	Muslim	1.0	1.0	1.0	1.0
	Christian	0.91 [0.82, 1.01]	**0.84 [0.75, 0.94]**	0.93 [0.84, 1.01]	**0.89 [0.80, 0.98]**
Residence	Urban	1.0	1.0	1.0	1.0
	Rural	1.07 [0.93, 1.22]	1.12 [0.97, 1.29]	1.11 [0.99, 1.25]	**1.14 [1.005, 1.30]**
Asset		0.98 [0.95, 1.02]	1.003 [0.97, 1.04]	1.01 [0.98, 1.04]	1.03 [0.996, 1.06]
Food security/self-sufficiency		**0.96 [0.93, 0.999]**	0.99 [0.95, 1.03]	1.01 [0.98, 1.04]	1.01 [0.97, 1.05]
Relative wealth	Less	1.0	1.0	1.0	1.0
	Same or more	**0.85 [0.78, 0.93]**	0.94 [0.85, 1.03]	**0.86 [0.79, 0.93]**	**0.89 [0.81, 0.97]**
Diagnosis	Schizophrenia	1.0	1.0	1.0	1.0
	Bipolar disorder	**0.86 [0.77, 0.95]**	**0.79 [0.71, 0.88]**	1.03 [0.94, 1.12]	0.96 [0.87, 1.06]
	Major depressive disorder	0.97 [0.86, 1.09]	**0.84 [0.74, 0.96]**	1.08 [0.97, 1.21]	1.01 [0.90, 1.14]
Course type for psychosis	Episodic	1.0	1.0	1.0	1.0
	Continuous	**1.41 [1.25, 1.60]**	**1.46 [1.28, 1.66]**	**1.17 [1.04, 1.32]**	1.12 [0.99, 1.28]
	Neither	**1.31 [1.07, 1.60]**	**1.26 [1.01, 1.57]**	1.16 [0.97, 1.38]	1.05 [0.86, 1.27]
	Never psychotic	0.99 [0.88, 1.11]	0.97 [0.86, 1.10]	0.99 [0.90, 1.10]	0.97 [0.88, 1.08]
BPRS-E[c]		**1.02 [1.01, 1.03]**	**1.26 [1.02, 1.03]**	**1.01 [1.003, 1.02]**	**1.02 [1.01, 1.03]**
Total MINI score[d]		**1.03 [1.01, 1.05]**	1.00 [0.98, 1.02]	**1.02 [1.00, 1.04]**	0.99 [0.97, 1.01]
Total ISMI score[e]		**1.01 [1.008, 1.014]**	**1.008 [1.005, 1.01]**	**1.01 [1.005, 1.01]**	**1.005 [1.00, 1.01]**
Problematic khat use	No	1.0	1.0	1.0	1.0
	Yes	1.18 [0.99, 1.41]	**1.48 [1.23, 1.80]**	1.02 [0.87, 1.19]	**1.24 [1.04, 1.47]**
Medication side effect	None	1.0	1.0	1.0	1.0
	One	1.22 [0.98, 1.52]	1.24 [0.98, 1.56]	1.03 [0.86, 1.23]	1.05 [0.86, 1.27]
	Two or more	**1.22 [1.10, 1.35]**	**1.28 [1.15, 1.44]**	**1.16 [1.05, 1.28]**	**1.23 [1.10, 1.37]**
Medication adherence		0.997 [0.97, 1.03]	0.996 [0.96, 1.03]	1.005 [0.98, 1.03]	1.001 [0.98, 1.04]
				N[f]= 309 Pseudo R^2= 0.06	N[f]= 310 Pseudo R^2= 0.06

[a]CRR: Crude Relative Risk
[b]ARR: Adjusted Relative Risk
[c]BPRS-E: expanded version of the Brief Psychiatric Rating Scale
[d]MINI: Mini International Neuropsychiatric Interview
[e]ISMI: Internalized stigma of mental illness
[f]N: Number of observations